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IS 13602 (1992): Automotive vehicles - Instrument systems - Temperature gauges mechanical types [TED 11: Automotive Electrical Equipment]

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Indian Standard

AUTOMOTIVE VEHICLES — INSTRUMENT SYSTEMS — TEMPERATURE GAUGES MECHANICAL TYPES — SPECIFICATION

UDC 629·113·056·6 : 531·78

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

December 1992 **Price Group 2**

Automotive Instruments Sectional Committee, TED 10

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

Mechanical type temperature gauges are used for indicating the temperature of the lubricating oil or cooling water.

For the purpose of deciding whether a particular requirements of this standard is complied, with the final value, observed or calculated, expressing the result of a test or analysis; shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — INSTRUMENT SYSTEMS — TEMPERATURE GAUGES MECHANICAL TYPES — SPECIFICATION

1 SCOPE

This standard specifies requirements for temperature gauges of mechanical type used for indicating lubricating oil or cooling water temperature of automotive engines.

2. REFERENCES

The following Indian Standards are necessary adjuncts to this standard.

IS No.	*Title*
101 (Part 6/ Sec 1) : 1988	Methods of sampling and test for paints, varnishes and related products: Part 6 Durability tests, Sec 1 Resistance to humidity under conditions of condensation (*third revision*)
2500 (Part 1) : 1973	Sampling inspection tables: Part 1 Inspection by attributes and by count of defects (*first revision*)
9000 (Part 3/ Sec 3) : 1977	Basic environmental testing procedures for electronic and electrical items: Part 3 Dry heat test, Sec 3 Dry heat test for non-heat dissipating items with sudden change of temperature
9000 (Part 7/ Sec 2) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Sec 2 Bump
9000 (Part 7 / Sec 3) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Sec 3 Drop and topple
9000 (Part 14/ Sec 1) : 1988	Basic environmental testing procedures for eletronic and electrical items: Part 14 Test N : Change of temperature, Sec 1 Test Na : Rapid change of temperature (thermal shock) with prescribed time of transition — Two chamber method (*first revision*)
9000 (Part 14/ Sec 2) : 1988	Basic environmental testing procedures for electronic and electrical items: Part 14 Test N: Change of temperature, Sec 2 Test Nb : change of temperature (temperature cycling) with specified rate of change — One chamber method
9000 (Part 14/ Sec 3) : 1988	Basic environmental testing procedures for electronic and electrical items : Part 14 Test N : Change of temperature, Sec 3 Test Nc : Rapid change of temperature (thermal shock) — Two fluid bath method (*first revision*)
9000 (Part 16) : 1983	Basic environmental testing procedures for electronic and electrical items: Part 16 Driving rain test
10250 : 1982	Severities for environmental tests for automotive electrical equipment
11086 : 1984	Speedometers and odometer systems for automotive applications

3 TYPES AND CLASSES

Mechanical type of gauges are broadly classified as bourdon tube (Class 1) and diaphragm (Class 2) types. A typical gauge is shown in Fig. 1.

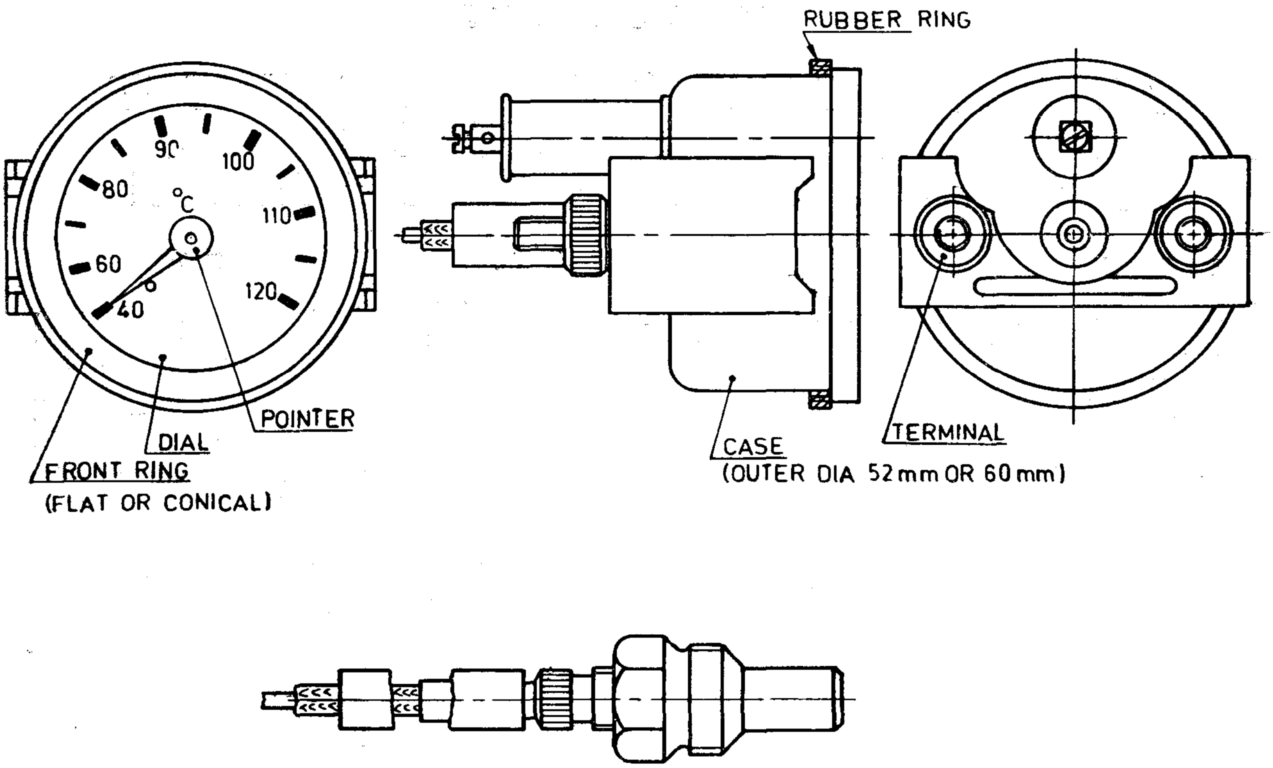
4 GENERAL REQUIREMENTS

4.1 The gauges shall comprise of an integrated (unitized) sendor receiver units.

4.2 The graduation shall be in degrees Celsius. Points of lowest, middle and highest shall be indicated in the graduations. Typical dimensions shall be specified. Arrangements for illumination and details of tubing shall be agreed between manufacturer and purchaser.

5 SAMPLING

Unless otherwise agreed upon, the sampling plan shall be in accordance with IS 2500 (Part 1) : 1973.



SENDOR UNIT

FIG. 1 MECHANICAL TEMPERATURE GAUGE

6 TESTS

6.1 Test Conditions

The temperature, humidity shall be maintained steady. For error determination the temperature shall be 25 ± 5°C.

6.2 Performance

The gauge shall be tested against requirements specified below as per IS 10250 : 1982. The gauge shall be mounted in an identical position as in a vehicle and tested over two-thirds of its range. The error in temperature indication at any instant taken both up and down the scale shall not exceed ± 3 percent over the specified value. The testing shall be done over the last two-third of full scale reading.

6.3 Indication Error

The difference in the readings between the highest and lowest graduation temperature shall not exceed ± 5 percent for high and middle graduation temperature.

NOTE — The temperature range at any one point between 70°C to 90°C in case of water thermometer and between 80°C to 100°C in the case of oil thermometers shall denote middle graduation point.

6.4 Heating and Rapid Cooling

When the sendor unit of the gauge is kept in a solution at about 100°C for five minutes and then immediately cooled in the water at normal temperature for five minutes. This process is repeated three times. At the end of the test, there shall be no abnormalities. The permissible variation of the observed values from the initial values shall be ± 2 percent.

6.5 Temperature Resistance

6.5.1 When the indicator is tested as specified in IS 9000 (Part 14/Sec 1 to 3) : 1988 each part shall comply with **6.3** and **6.4**. The test temperature shall be 85°C for two hours. The permissible variation between the observed and initial values shall be ±2 percent.

6.5.2 *Low Temperature Test*

When cooled down to 0°C for 48 h, the dimensional and indication error of the systems shall not vary by more than ± 2 percent of the initial values and brought back to ambient temperature.

6.6 Vibration Test

When the gauge and the receiver unit is mounted on a Vibration tester to produce a simple harmonic motion, it shall vibrate through a frequency range of 10-55-10 Hz in one minute. With continuously varying frequencies the vibration shall be applied for not less than one hour in each of the three major axis as per IS 11086 : 1984. When the sendor unit is vibrated as specified in IS 11086 : 1984 and operated at a temperature of about 80 percent of the highest graduation, the variation of the indication from that before the test shall be ± 2 percent of the difference between the highest and lowest graduation temperatures. No abnormalities shall exist in other parts. The receiver unit and sendor unit shall be tested separately.

6.7 Endurance Test

6.7.1 The gauge when subjected to repeated heating and cooling from the lowest graduation to 80 percent of the highest graduation temperature and then cooled to lowest graduation temperature for 5 000 times at the rate of six minutes per cycle the variation from that before the test not exceed 7 percent of the difference between the highest and the lowest graduation temperatures. No abnormalities shall exist in other parts.

6.7.2 The breaking strength and elongation strength shall be checked on an universal testing machine. Either metallic braided sleeve or coiled spring shall be used to protect the capillary from any external damage. PVC sleeve shall also be used along with the above as an option in place where electrical insulation is required.

NOTE — The type of protection shall be as agreed to between the purchaser and supplier.

6.8 Water Spray

When the gauge is exposed to direct water spray for 30 minutes and visually checked, no significant blur shall be observed on the glass inside of the receiver unit. If a lighting arrangement or ventilation hole is provided only the front glass shall be tested. The permissible variation between the observed values from the initial value shall be ± 2 percent Any ingress of water shall be checked as specified in IS 9000 (Part 16) : 1983.

6.9 Dust Test

The gauge shall comply with **4.6** of IS 10250 : 1982.

6.10 Dry Heat Test

When subjected to dry heat test in accordance with IS 9000 (Part 3/Sec 3) : 1977 the gauge shall comply with **4.2.2** of IS 10250 : 1982.

6.11 Drop Test

When tested after the drop test carried out in accordance with IS 9000 (Part 7/Sec 3) : 1979 the gauge shall indicate a permissible variation of ± 2 percent between the initial and observed values.

6.12 Bump Test

After the bump test carried out in accordance with IS 9000 (Part 7/Sec 2) : 1979 the permissible variation between the observed and the initial values shall not exceed ± 2 percent.

6.13 Visual Tests (for Painting)

The paint film not exposed directly to rain or wind shall be tested by immersing in a water solution kept at a temperature of 40°C for one hour. The film is then allowed to dry for one hour. The painted surface edges of the indicator and case shall be free from peeling due to paint softening, flooding or discolouration. This condition however shall not be applicable for resin bases.

The paint film exposed directly to wind or rain shall comply with class 2 or class 3 of water resistance and class 2 corrosion resistance of IS 101 (Part 6/Sec 1) : 1988.

6.14 Salt Spray Test

After carrying out the test given in Appendix A of IS 10250 : 1982 the gauge shall be subjected to high voltage (flash) test and the performance test. The permissible variation of the observed values from the initial values shall be ± 2 percent. Appearance of the product after test shall not prejudice assessment of results. After salt spray test there shall not be significant corrosion of part.

6.15 Plating

Plating of surface edges shall be in accordance with Table 1. The total thickness of chromium plating on resin base shall be more than 10 microns.

Table 1 Plating Requirements for Indicator and Gauge Case (for Surface Exposed/Not Exposed Directly to Wind or Rain)

	Base	Thickness	
Nickel	Iron	10 microns	
	Brass	5 microns	
Chromium	Iron	10 microns	
	Brass	5 microns	
Zinc	Iron	5 microns	8 microns (exposed directly)

7 MARKING

The instrument shall be marked with symbol for the gauge, indicating the source of manufacture, serial number, date of manufacture, trade/brand name, printed preferably on the dial.

Any other marking as agreed to between the suppliers and the purchasers may also be printed.

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The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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